

What Effects Did the 2001 to 2003 Tax Cuts Have on the Economy?

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Summary

Recession concerns have led policymakers to consider economic stimulus legislation. These proposals have raised questions about the economic effects of past policy changes. Congress enacted major tax cuts in 2001, 2002, and 2003. The acts reduced marginal income tax rates; reduced taxes on married couples, dividends, capital gains, and on estates and gifts; increased the child tax credit; and accelerated depreciation for business investment. The tax cuts resulted in an estimated revenue loss of 0.4% of GDP in 2001, 1.1% in 2002, and 1.6% in 2003. Since government spending rose as taxes were cut, the cuts can be characterized as deficit financed.

It is hard to be certain what effects the tax cuts have had on the economy because there is no way to compare actual events to the counterfactual case where the tax cuts were not enacted. The most common method of estimating a tax cut's effect is to feed it into a macroeconomic model of the economy and see what the model predicts. Note that this is typically done before the fact: economic estimates of the tax cut's effect are not based on actual *ex post* data. These estimates are highly uncertain because there is no one macroeconomic model that adequately captures all of the economy's dynamics, no consensus among macroeconomists as to which one model is most suitable for policy simulations, and no model with a strong track record in accurately projecting economic events.

Most estimates predicted that the tax cuts would increase economic growth in the short-term and reduce it in the long run. For example, the Joint Committee on Taxation predicted that the 2003 tax cut would increase GDP by an average of 0.2% to 0.5% in the first five years and decrease it by -0.1% to -0.2% over the next five years. Keynesian models find the largest positive short-term effect of the tax cuts on the economy. But these effects are completely temporary because they focus on how tax cuts boost aggregate spending; in the long run, prices adjust, and production rather than spending determines the level of output. In neo-classical (Solow) growth models, deficit-financed tax cuts reduce national saving, thereby reducing national income because capital investment can only be financed through national saving or foreign borrowing. If the latter occurs, the result will be an increased trade deficit. In intertemporal models, a deficit-financed tax cut is unsustainable: it must be offset in the future by a tax increase or spending cut to prevent the national debt from growing indefinitely. Thus, in these models, tax cuts followed by tax increases lead individuals to shift work and saving into the low-tax period, increasing growth then, and out of the high-tax period, reducing growth then.

The period encompassing the tax cuts featured a recession of average duration but below-average depth, an initially sluggish recovery, a deep and unusually long decline in employment, a small decline in hours worked, a sharp and long lasting contraction in investment spending, a significant decline in national saving, and an unusually large trade deficit. Opponents see this as evidence that the tax cuts were ineffective; proponents argue that the economy would have performed worse in their absence. Also consider that some, perhaps most, of the recovery was due to monetary rather than fiscal stimulus.

Contents

Introduction	1
A Brief Description of the Tax Cuts	1
Pitfalls in Estimating the Economic Effects of Tax Cuts.....	3
A Tax Cut’s Predicted Effects Depend on the Model Used.....	5
Demand Side Effects of a Tax Cut in a Keynesian Model	5
Economic Growth and Employment.....	5
“Bang for The Buck”	8
How Much Stimulus Was Attributable to Monetary Policy?	9
Inflation.....	10
Consumption.....	11
Effects of a Tax Cut in Long-Term Growth Models	11
Neoclassical Solow Growth Model.....	12
Saving and Investment.....	12
The Trade Deficit	14
Supply-Side Effects of a Tax Cut on Labor and Saving.....	14
Intertemporal Models	17
Overview of Simulations.....	18
Simulations of EGTRRA’s Effects	18
Macroeconomic Advisers.....	18
DRI-WEFA	19
Auerbach.....	19
Gale and Potter.....	19
Economic Effects of the 2001 Rebate	20
Simulations of JGTRRA’s Effects	21
JCT.....	21
CBO	21
Macroeconomic Advisers.....	22
Global Insight	23
Conclusion.....	23
Economic Growth in a Keynesian Model	24
Investment, National Saving, Interest Rates, and Growth in the Solow Model.....	24
Trade Deficit	24
Employment and Unemployment in a Keynesian Model	25
Supply-Side Effects on Labor Supply and Private Saving.....	25

Tables

Table 1. Estimated Revenue Loss from the Tax Cuts	2
Table 2. Average Marginal Tax Rates Under EGTRRA/JGTRRA in 2011	3
Table 3. GDP Growth in Historical Recessions.....	7
Table 4. Decline in Employment during Historical Recessions and Recoveries.....	7
Table 5. Lowest Federal Funds Rate in Each Recessionary Episode, 1958-2003	9
Table 6. Growth Rate of GDP, Consumption, and Investment, 2000-2004.....	11
Table 7. Budget Deficits, Trade Deficits, Saving, and Investment.....	13

Table 8. Labor Supply and Saving Indicators, 2000-2004	16
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Contacts

Author Information.....	25
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Introduction

Concerns that the economy might be heading toward a recession have led some policymakers to consider economic stimulus legislation. To judge the efficacy of such proposals, some policymakers have expressed a desire to look back at the economic effects of past policy changes. Proponents of the tax cuts passed in 2001, 2002, and 2003 argued that they would have salutary effects on the economy. Particular emphasis was placed on economic stimulus in the short-term.

This report traces out the channels through which the tax cuts are thought to affect the economy and assesses the performance of those economic indicators, including gross domestic product (GDP), employment, interest rates, inflation, labor supply, saving, capital investment, and the trade deficit. The report uses theory and data to evaluate the tax cuts' effects through 2004. (This report does not analyze economic developments since 2004. Presumably, individuals had adjusted their behavior to the tax changes by then, and economic developments since have not been significantly influenced by tax cuts enacted several years earlier.) The report also offers an overview of the forecasts of their effects made at the time the tax cuts were passed. Most estimates predicted that the tax cuts would increase economic growth in the short-term and reduce it in the long run. Despite the wide diversity of the models used, all of the results are relatively small, as would be expected of tax cuts that are relatively small in relation to GDP in the years considered.

A Brief Description of the Tax Cuts

Three tax cuts have been signed into law in recent years. This report focuses on provisions of those bills that caused significant revenue loss from 2001 to 2003. In 2001, the Economic Growth and Tax Relief Reconciliation Act was signed into law (EGTRRA, P.L. 107-16). Its major provisions for 2001-2004 were a reduction in marginal income tax rates, an increase in the child tax credit, "marriage penalty" tax relief, and elimination of the estate tax. All of these provisions were phased in gradually over several years, and then scheduled to expire due to budget rules (although it was the framers' stated intent that they become permanent).¹ In 2002, the Job Creation and Worker Assistance Act (JCWAA, P.L. 107-147) was signed into law. Its major revenue-side provision was accelerated depreciation for business investment. In 2003, the Jobs and Growth Tax Relief Reconciliation Act (JGTRRA, P.L. 108-27) was signed into law. It accelerated the phase in of the main EGTRRA provisions, with the exception of the estate tax provisions, and extended and expanded the accelerated depreciation in JCWAA. It also reduced the tax rates on dividend and capital gains income. In addition, the 2004 Working Family Tax Relief Act (WFTRA, P.L. 108-311) extended some provisions of the earlier acts that were slated to expire. It had no revenue effect in 2004.

Table 1 gives the estimated revenue loss of the tax cuts and their key provisions as scored by the Joint Committee on Taxation at the time the tax cuts were enacted. Estimates of the cost of the tax cuts based on *ex post* data do not exist.² EGTRRA was the largest of the tax cuts and most of EGTRRA's costs are to occur in the out years. Most of the costs of JGTRRA and JCWAA occurred in the short-term. In fact, because accelerated depreciation is a revenue loser in the

¹ Proposals to make part or all of EGTRRA/JGTRRA permanent can be found in the Administration's budget proposal for FY2007 and several dozen congressional bills.

² Actual tax receipts fell significantly more than predicted by the *ex ante* scores, even after controlling for economic conditions. This suggests that the tax cuts may have resulted in more revenue loss than predicted. See CRS Report RS21786, *The Federal Budget Deficit: A Discussion of Recent Trends*, by Gregg A. Esenwein, Marc Labonte, and Philip D. Winters.

short-term and revenue raiser in the medium-term, the 10-year cost of JCWAA is smaller than the short-term cost. In the long run, it was by far the smallest of the three, but of comparable size in the time period considered here. JGTRRA's costs are mainly short-term because it mostly accelerates tax cuts that would have occurred later under EGTRRA. All of the tax cuts are temporary and scheduled to expire, although it was the intention of their supporters that EGTRRA/JGTRRA be permanent.

Table 1. Estimated Revenue Loss from the Tax Cuts
(billions of dollars)

	2001	2002	2003	2004	10 Year Total
<i>Tax Acts</i>					
EGTRRA, 2001	40	71	91	102	1,349
JCWAA, 2002	-	42	39	29	30
JGTRRA, 2003	-	-	50	135	320
WFTRA, 2004	-	-	-	-	122
<i>Provisions</i> (cumulative totals for all tax acts)					
Marginal Rate Reductions	40	55	61	69	875
Child Tax Credit	1	9	24	17	204
Marriage Penalty Relief	0	0	6	26	98
Estate and Gift Tax Reductions	0	0	7	6	138
Dividend and Capital Gains Tax Reduction	-	-	4	17	148
Accelerated Depreciation	-	35	44	65	26

Source: Joint Committee on Taxation.

Notes: Estimates do not include outlay provisions or cost of additional debt service. Table omits effects of date shifting on yearly revenue loss. Cumulative costs for JCWAA and accelerated depreciation provisions are lower than the years shown because of revenue offsets in outyears.

Consistent with the goal of short-term stimulus, this report focuses on the effects of the tax cuts through 2004. Certain provisions that are large in the long run are small to date and will not be explored, most notably the repeal of the estate tax. Other provisions, such as accelerated depreciation, were large in the short run, but not in the long run. Although the costs of the tax cuts are large as a fraction of total receipts, particularly in the out years, the costs as a percentage of gross domestic product (GDP) in the years of interest are small. The small size of the tax cuts places a low ceiling on their potential economic effects. This is especially the case when evaluating demand-side effects, where their incremental increase from year to year, rather than their absolute value, is the relevant figure. In 2001, the tax cuts (revenue provisions only) were equal to 0.4% of GDP, all of which occurred in the second half of the year. In 2002, they increased 0.7 percentage points to 1.1% of GDP. In 2003, they increased 0.5 percentage points to 1.6% of GDP. In 2004, they increased 0.7 percentage points to a projected 2.3% of GDP.

As discussed below, when considering the effects of tax cuts on labor supply and saving, the key measure is marginal tax rates. As seen in **Table 2**, the change in average marginal tax rates under EGTRRA and JGTRRA is modest for wages and interest income when fully phased in; however, EGTRRA/JGTRRA leads to a larger decline in marginal rates on capital gains income and a more than 50% decline in marginal rates on dividend income.

Table 2. Average Marginal Tax Rates Under EGTRRA/JGTRRA in 2011

(percent)

	Wage Income	Interest Income	Dividend Income	Capital Gains Income
Prior Law	26.0	25.3	28.8	19.9
EGTRRA/JGTRRA	24.4	23.2	13.2	15.5

Source: CRS calculations based on data from Office of Tax Analysis and Joint Committee on Taxation.

Notes: Marginal tax rates under EGTRRA/JGTRRA vary by year as various provisions are phased in and out. The table shows marginal tax rates in 2011 when the tax cuts are fully phased in. Marginal tax rates include only the individual income tax system; they do not include marginal rates on, for example, wages from the payroll tax system or the corporate tax system. Marginal rates on capital income do not apply to capital income held in tax preferred accounts.

Because government spending rose as a percentage of GDP in the years when taxes were cut, these tax cuts can be characterized as wholly deficit-financed tax cuts (financed by increasing the deficit or decreasing the surplus). This is important to note because deficit-financed tax cuts have a different economic effect than tax cuts financed by reducing spending or raising other taxes in the models described below.

Pitfalls in Estimating the Economic Effects of Tax Cuts

It may be surprising to learn that *there is no straightforward way to evaluate how a tax cut has affected the economy*. Economists can observe how the economy performed after a tax cut, but because they cannot observe the counterfactual—how the economy would have performed in the absence of a tax cut—there is no direct way to tell what contribution the tax cut made to the economy's performance. If the economy boomed after a tax cut, there is no way of telling whether the economy would have boomed even if the tax cut had not been passed. If the economy grew sluggishly after a tax cut, there is no way of telling whether the economy would have grown even more slowly without a tax cut.

Econometric research is based on observing variation between data observations to determine correlation between variables. For studies of individual behavior, variations in the tax cut that individuals receive can be used to establish correlation. If recipients of a tax cut systematically behave differently than nonrecipients, all else equal, it can be deduced that the tax cut caused that behavior. Unfortunately, in the case of tax cuts, variation between individuals is not independent of other control variables needed to hold all else equal. The size and eligibility of a tax cut is based on criteria that may strongly influence an individual's behavior. For example, the size of the marginal tax rate reduction received under EGTRRA is determined by factors such as income. Yet if the experience of individuals in one income cohort is systematically different than in a different cohort, a tax cut could be erroneously attributed as the cause when some other factor was the cause. For example, income inequality has been growing in the United States in recent decades because the income of upper-income cohorts has been rising more quickly than lower-income cohorts. Because EGTRRA gave larger tax cuts to upper-income cohorts on average,³ the

³ Distributional analysis for all recent tax cuts have been estimated by the Tax Policy Center, <http://www.taxpolicycenter.org/TaxModel/tmdb/TMTemplate.cfm>. Distributional analysis for some tax cuts are also available online from the U.S. Treasury's website at <http://www.treas.gov/press/taxes.html>.

portion of faster income growth caused by growing inequality, unless properly controlled for, would be spuriously attributed to the larger tax cut.⁴

For economy-wide studies, the variation studied is typically over time rather than across individuals. In the case of a tax cut, this would entail comparing how the economy performed in periods with the tax cut compared to periods without the tax cut. But because other factors are also changing over time, different control variables are not independent, and causation runs in both directions, it is very difficult to isolate the effect of tax cuts. For example, consider a tax cut implemented to stimulate the economy in response to a downturn. Comparing economic activity before and during the tax cut, simple correlation could lead to the conclusion that tax cuts cause recessions since the timing of the tax cut is associated with a decline in growth. Some other factor is necessary to control for this “endogeneity” problem. Some econometric methods can overcome the endogeneity problem, but greatly limit the number of control variables that can be employed because of insufficient “degrees of freedom.” Some time series analysis has been criticized for assuming that individuals do not change their reactions in response to changes in the behavior of policymakers (known as the “Lucas critique”). Because there have been relatively few major tax cuts or increases in recent history, there are relatively few observations to consider.⁵

In this situation, economists typically predict a tax cut’s economic effects by building econometric forecasting models, calibrating the models to match actual economic data, and then running the model with and without a tax cut. The difference between the two outcomes is said to be the tax cut’s economic effects. Notice that this approach *does not* rely on actual, after the fact data to determine the tax cuts’ effects. These simulations are typically run before the tax cut is implemented, and it is rare for the modeler to go back after the fact and test the accuracy of the prediction. As shown in the section below, *none* of the predictions made for EGTRRA and JGTRRA were based on actual *ex-post* data. (Using *ex-post* data would improve the accuracy of the results, but not avoid all of the problems discussed above.)

This method of estimating a tax cut’s effects would be less problematic if there were widespread consensus that one particular econometric model could accurately predict economic activity. In fact, econometric models are sometimes poor predictors of economic activity, even over short periods of time. Although some models have proven capable of making reasonably accurate short-term projections during expansions, no model has proven able to correctly predict turning points in the business cycle on a regular basis. For example, every month the company Blue Chip surveys 50 private forecasters. Not one of the 50 forecasters predicted the 2001 recession until April 2001—a month after the recession had started. There is little consensus over the correct approach in theory to modeling macroeconomic activity, so there are many competing models that radically differ in basic and fundamental ways. The Congressional Budget Office (CBO) and Joint Committee on Taxation (JCT) have responded to this problem by using several different models to offer a range of predictions of a proposal’s effects. As shown below, these models predict that tax cuts will have widely different—sometimes contradictory—economic outcomes. Given these circumstances, it is difficult to argue that model-based predictions offer a reliable proxy for the tax cuts’ actual effects.

⁴ Austan Goolsbee, “It’s Not About the Money,” in Joel Slemrod, ed., *Does Atlas Shrug? The Economic Consequences of Taxing the Rich*, (Cambridge, MA: Harvard University Press, 2000), p. 143.

⁵ An endogenous variable is one that simultaneously affects other variables and is affected by those variables. Degrees of freedom are calculated as the number of observations minus the number of explanatory variables. It must be positive for statistical inference. Higher degrees of freedom lead to more robust analysis.

A Tax Cut's Predicted Effects Depend on the Model Used

As discussed above, there is no consensus as to which type of macroeconomic model best describes reality. Each model captures certain aspects of economic behavior well, but no model adequately synthesizes all the different aspects at once. Because economists differ on which aspects of economic behavior are most important, they also differ on which model is preferable for evaluating policy. No model described below is right or wrong; each has unique strengths and weaknesses.⁶ But the predicted effects of a tax cut will be highly sensitive to the assumptions of the model used to evaluate it. Because the models are not integrated, a major problem with the estimates is that if there are effects caused by properties that the model being used neglects, the effects will be incorrectly attributed to other properties that are included in the model being used. For example, if a tax cut boosted aggregate demand, a supply side model would attribute the rise in output to an increase in labor or saving, even though the increase would not necessarily be induced by incentives, would not necessarily be permanent, nor would it necessarily be replicable at a different point in the business cycle.

Demand Side Effects of a Tax Cut in a Keynesian Model

Keynesian models focus on aggregate demand, or the spending side of the economy, rather than the aggregate supply, or the production side of the economy. Because recessions are typically thought to be shortfalls in aggregate spending relative to potential supply (production if all of the economy's labor and capital resources were fully employed), Keynesian models are popular for short-term policymaking and forecasting purposes. Professional forecasters, including CBO, Office of Management and Budget (OMB), the Federal Reserve, Global Insight, and Macroeconomic Advisers, use models with Keynesian attributes in the short run to predict economic activity. However, the richness of the models' development of the demand side of the economy comes at the expense of their ability to explain the supply side. This makes these models of more limited usefulness for explaining and prescribing policies when the economy is fully employed. Because aggregate demand can fall below aggregate supply only in the short run, before prices adjust, Keynesian models are also of limited usefulness in explaining the long run.

Economic Growth and Employment

Using fiscal policy to boost aggregate spending is often popularly referred to as "stimulating the economy," and evaluating a "stimulus package" is best done by looking at its effects on aggregate spending using a Keynesian model. In these models, the government can boost spending in the economy by increasing the budget deficit. If the deficit is the result of increased government spending, aggregate spending is boosted directly because government spending is a component of aggregate demand. Because the deficit is financed by borrowing from the public, resources that were previously being saved are now being used to finance government purchase or production of goods and services. If the deficit is the result of tax cuts, aggregate spending is boosted by the tax cut's recipient to the extent that the tax cut is spent (not saved or invested in financial securities).⁷

⁶ Commercial forecasting models, such as Global Insight and Macroeconomic Advisers, incorporate aspects of supply side and Solow Growth models in their results, but Keynesian effects dominate the results over the first few years of the projection.

⁷ A tax cut that was financed by lower government spending would not stimulate aggregate spending because the increase in private spending among the tax cut's recipients would be offset by the decrease in government spending. In the Keynesian model, the key to a stimulus is the larger deficit, not the tax cut.

In this case, resources that were previously being saved are now at the disposal of the tax cut recipient, and to the extent that the recipient decides to increase his consumption, aggregate spending will rise.

In this model, the increase in aggregate spending does not stop there. When spending increases, idle labor and capital resources are brought back into use, leading to an increase in employment and decrease in unemployment. This generates new production, and income accrues to those previously idle resources, which can then be spent by the worker or owner of capital. This process is repeated, producing a “multiplier effect” so that the eventual increase in aggregate spending exceeds the initial increase in the budget deficit. It is assumed that it will take some time for the full effects of the stimulus to be felt. Some prominent Keynesian models predict most of the effects are felt within two years.

The effects of fiscal stimulus can be visualized in terms of a simple supply and demand diagram, where the boost in demand brings the economy to a new, higher equilibrium with supply. Because the supply curve is sloped upward, the ultimate increase in output is less than the boost in demand; if the supply curve were vertical the boost in demand would ultimately lead to zero increase in output. Economists cannot directly observe distinct supply and demand curves; they can observe only the single point of equilibrium between them, and this is recorded as gross domestic product. Thus, there is no direct way to determine whether a change in GDP is demand or supply driven. Simple Keynesian models assume, in essence, that all changes in GDP are demand-side phenomena and can be explained by the process above. (The other models considered below assume that all changes in GDP are supply-side phenomena.) In recessions, this assumption is often valid (unless the recession is caused by a “supply shock,” such as an increase in the price of oil). In expansions, the assumption is problematic because aggregate spending already matches potential production, in which case the process described above may be a poor guide for explaining reality. Thus, the same tax cut implemented at full employment will result in a significantly smaller boost to aggregate spending and employment than during a recession.

Since the 2001 tax cuts took place during a recession and the 2002-2003 tax cuts took place during a period of sluggish recovery characterized by an economy operating below full employment, the Keynesian framework is a valid one to capture, at least in part, the effects of these tax cuts on the economy. In this framework, these tax cuts would be predicted to stimulate aggregate demand, which would be manifested in the data as an increase in GDP growth. The size of the stimulus would be small relative to GDP since the incremental increase in the budget deficit was small (less than 1% of GDP) each year.

How did the economy react following the tax cuts? In evaluating the effect of the tax cuts on aggregate demand, the unusual nature of the economic recession and recovery poses a serious problem. Keynesian models predict that tax cuts will boost GDP growth *and* employment (and other measures of capacity utilization). Beginning in the fourth quarter of 2001, growth and employment moved in opposite directions.

Based on GDP data, this recession and subsequent recovery was characterized by its mildness: the decline in GDP during the recession was relatively brief and shallow, and economic output returned to its previous peak quickly—although growth was not initially rapid in the recovery, GDP was not far below its peak. This is illustrated in **Table 3**. Based on these data, the argument could be made that EGTRRA prevented a deeper and longer recession from taking place. Alternatively, it could be argued that, despite very large tax cuts, the recession was a comparable length to (although it was clearly shallower than) other recessions in which taxes were not cut.

Furthermore, there is the question of whether the tax cuts that came after EGTRRA were useful in stimulating aggregate spending, even if it is believed that the earlier ones were. Historical

experience shows that eventually recessions end on their own through market adjustment and monetary expansion. Every recession in the post-war period has lasted less than a year and a half. By the time JGTRRA was implemented—two years after the recession had ended—it can be argued that the economy was in little need of further stimulus. And unlike most recoveries, GDP growth was sluggish for the first six quarters of this recovery, despite three tax cuts. This view would lead to the conclusion that the tax cuts, particularly the latter two, made no impression on the normal market forces that determine expansion and contraction. The counter-argument would stress the initially sluggish nature of the recovery as evidence that further stimulus was required.

Table 3. GDP Growth in Historical Recessions

Period	Duration of Recession (months)	Percent Decline in GDP (cumulative)	Quarters After Recession Until GDP Reached Previous Peak	GDP Growth in First Four Quarters of Recovery
1949:1 - 1949:4	8	-1.6	1	13.4
1953:3 - 1954:1	10	-2.7	1	6.2
1957:4 - 1958:1	8	-3.7	3	7.3
1960:2 - 1960:4	10	-1.6	2	6.3
1969:4 - 1970:1	11	-0.6	2	0.2
1973:3 - 1975:1	16	-3.0	3	6.4
1980:1 - 1980:3	6	-1.9	2	4.3
1981:4 - 1982:3	16	-2.9	3	5.5
1990:3 - 1991:1	9	-1.5	3	2.3
2001:1 - 2001:3	9	-0.2	2	2.2

Source: National Bureau of Economic Research, Bureau of Economic Analysis.

Based on employment, unemployment, capacity utilization rates, and related measures, the recent recession was deep and extremely long, and the recovery was unusually sluggish, as shown in **Table 4**. Of the 10 post-war recessions, the 2001 recession had the seventh largest employment decline during the recession. But if the employment decline after the recession ended is included, it becomes the fifth largest, and the second largest in the past four decades. The unemployment rate did not begin to fall until mid-2003. Altogether, this was the longest period of employment in the post-war period. Likewise, the industrial capacity utilization rate was still below average through 2003.

Table 4. Decline in Employment during Historical Recessions and Recoveries

Recession Dates	Percent Decline in Employment During Recession	Percent Decline in Employment After Recession Ended	Number of Months That Employment Declined After Recession Ended	Date Employment Surpassed Previous Peak
Nov. 1948-Oct. 1949	6.2	0.0	0	Aug. 1950
July 1953-May 1954	3.8	0.5	3	July 1955
Aug. 1957-Apr. 1958	4.9	0.4	2	July 1959
Apr. 1960-Feb. 1961	2.1	0.0	0	Feb. 1962

Recession Dates	Percent Decline in Employment During Recession	Percent Decline in Employment After Recession Ended	Number of Months That Employment Declined After Recession Ended	Date Employment Surpassed Previous Peak
Dec. 1969-Nov. 1970	1.8	0.0	0	Dec. 1971
Nov. 1973-Mar. 1975	2.7	0.4	1	June 1976
Jan. 1980-July 1980	1.4	0.0	0	Feb. 1981
July 1981-Nov. 1982	3.4	a	1	Oct. 1983
July 1990-Mar. 1991	1.3	0.6	11	May 1993
Mar. 2001-Nov. 2001	1.9	1.2	21	Feb. 2004

Source: U.S. Bureau of Labor Statistics data from the establishment survey for non-farm private sector employment; recessions dated by NBER.

a. less than 0.1%.

By these measures, making the case that the tax cuts boosted aggregate spending is more difficult. At best, it could be argued that the tax cuts prevented the decline in aggregate spending from being even longer and deeper. But why would this recession have been worse than others in the tax cuts' absence? To make this case, circumstances in this recession that made it unique would have to be identified. Some recent events can be used to make this case, such as the September 11 attacks (although they did not occur until the recession was almost over) and the stock market crash. However, this case is weakened by the role of monetary policy. The depth and duration of the "double dip" recessions of the early 1980s are widely attributed to the monetary contraction that preceded them; in recent years, monetary policy has played the opposite role, sharply mitigating any recessionary forces, as discussed below.

Does the employment or GDP data give a more accurate picture of the recession's depth and breadth? Although no single data set gives a complete picture of the economy, one compelling argument is that the GDP data understate the recession's severity. The strong growth in productivity throughout the recession and recovery suggests that the higher rates of productivity growth first registered in the late 1990s have continued to the present. If this is the case, then the economy's long-term sustainable growth rate has risen, in which case the 0.8% and 1.6% GDP growth rates achieved in 2001 and 2002, respectively, place the economy farther below full employment than would be the case if the economy grew at similar rates in earlier downturns.

"Bang for The Buck"

As discussed above, the key to evaluating a tax cut's effect as a stimulus is the extent to which it boosts aggregate spending. By definition, to boost aggregate demand, a stimulus package must lead to spending rather than saving. Any policy-induced increase in the deficit would lead to some increase in aggregate spending, all else equal. But one criticism that was made about the recent tax cuts was that they would deliver relatively little "bang for the buck" as a stimulus measure. That is, while they would boost aggregate spending in the economy, because of their design they would have a very low multiplier effect relative to alternative policy options.

Several arguments have been made for why the recent tax cuts provided relatively little "bang for the buck" compared to the alternatives.⁸ First, government spending has a greater multiplier effect

⁸ See CRS Report RS21126, *Tax Cuts and Economic Stimulus: How Effective Are the Alternatives?*, by Jane G.

than tax cuts because some portion of a tax cut is saved rather than spent. Second, it is believed that tax cuts for upper income cohorts—the primary recipients of the recent tax cuts—provide less bang for the buck than tax cuts for lower income cohorts because upper income cohorts have higher saving rates. Third, some argue that more of a tax cut will be saved if it is temporary rather than permanent. By law, major parts of EGTRRA and JGTRRA are scheduled to expire after 10 years. However, this factor may be inconsequential because individuals may view the tax cuts as permanent since the legislators who supported the tax cuts indicated their intention to make them permanent. Finally, certain provisions of the recent tax cuts are intended to promote saving rather than spending, such as the reduction in the taxation of dividends and the elimination of the estate tax. By definition, these provisions would not be stimulative.

Although the tax cuts could have been designed to have a larger bang for the buck for the reasons listed above, it is an open question as to whether the difference would have been substantial or negligible. Econometric models are typically not detailed enough in the modeling of fiscal policy to answer this question definitively. Further complicating the question, the alternative economic models discussed below predict different—in some cases, contradictory—factors that would make a tax cut more effective. For example, in the Solow growth model, a tax cut that promoted saving and discouraged consumption would have a more positive effect on growth. In any case, it is fair to say that the most important factor in determining the effect of fiscal stimulus on the economy is its size (the incremental increase in the budget deficit), not the specific form that the stimulus takes.

How Much Stimulus Was Attributable to Monetary Policy?

When considering the short-run effects of the tax cuts on GDP, one should also net out the stimulative effects of changes in monetary policy. Most economists believe that monetary policy has a strong effect on aggregate demand growth in the short run, and that lower interest rates were a more important factor than tax cuts in tempering the depth and length of the recession. Indeed, there was a large decline in the federal funds rate from 2000 to 2003. As can be seen in Table 5, in 2003 the federal funds rate reached its lowest nominal level since the 1957-1958 recession. (Federal funds rate data are not available for earlier recessions.)

However, this easing of policy is not unusually large by other measures. Adjusting the federal funds rate for inflation (*ex-post*) reveals that real interest rates were lower in three of the previous seven recessions than in 2003. And the recent decline in interest rates was smaller than any other recession in the previous three decades. Thus, monetary policy did not play a more prominent role than usual in mitigating the recession. Nor did monetary policy play a large role in causing the recession: short-term interest rates were raised by 1.75 percentage points between 1999 and 2000. This is much smaller than the episodes of significant monetary tightening in 1969, 1973, and 1980-1981, which are credited with contributing to the subsequent recessions.

Table 5. Lowest Federal Funds Rate in Each Recessionary Episode, 1958-2003

Date of Lowest Rate	Nominal Interest Rate	Real Interest Rate	Rate Change: Peak to Trough (percentage points)
May 1958	0.6%	-2.8%	2.9
July 1961	1.2%	-0.1%	2.8

Gravelle; CRS Report RS21136, *Government Spending or Tax Reduction: Which Might Add More Stimulus to the Economy?*, by Marc Labonte, "Fiscal Stimulus," *Economy.com Regional Financial Review*, February 2003.

Date of Lowest Rate	Nominal Interest Rate	Real Interest Rate	Rate Change: Peak to Trough (percentage points)
February 1971	3.7%	-1.0%	5.5
May 1975	5.2%	-4.1%	6.8 ^a
July 1980	9.0%	-4.2%	8.6
February 1983	8.5%	5.0%	10.5
December 1992	2.9%	-0.1%	7.0
June 2003	1.0%	-1.2%	5.5

Source: CRS calculations based on Federal Reserve and BLS data.

Note: Real interest rates calculated by subtracting nominal rates less inflation over previous 12 months. Interest rates measured as a monthly average. Rate change calculated on a nominal basis.

a. In the 1973-1975 recession, interest rates peaked nearly one year into the recession.

Inflation

In Keynesian models, the inflation rate is determined by the interaction of aggregate demand and supply. When aggregate demand exceeds supply, inflation rises because there is “too much money chasing too few goods;” when spending is inadequate to maintain full employment, inflation falls. Keynesian models are based on the assumption of “price stickiness”: prices are slow to adjust to changes in aggregate supply and demand.

A tax cut pushes up inflation by increasing aggregate demand, all else equal. Because of sticky prices, the entire increase in prices does not occur instantaneously. When the economy is already near full employment, the increase in inflation is likely to be quick and substantial (relative to the tax cut) because production is incapable of being increased enough to match the increase in spending. When the economy is below full employment, the increase in inflation would likely be smaller and slower because there can be a greater increase in production to meet the increase in spending.

When considering the effects of fiscal policy on inflation, it is highly unlikely that all else will remain equal in reality. Inflation is ultimately determined by the Federal Reserve’s manipulation of the money supply, and the Fed has shown a strong preference in recent decades for maintaining a relatively low and stable inflation rate. When evaluating the effects of a change in fiscal policy, the most realistic assumption to make is that the Fed would take steps to offset any inflationary effects that the policy change may have. Thus, the most realistic assumption to make about a tax cut in the abstract is that it will lead to higher short term interest rates (via tighter monetary policy) rather than higher inflation. This is particularly true if the tax cut takes place when the economy is near full employment, in which case the monetary response will negate most of the tax cut’s effect on aggregate spending. If the economy is in a recession, inflationary pressures are less likely to be a concern, and the Fed is less likely to allow interest rates to rise (i.e., it will accommodate the fiscal expansion).

In the case of the recent tax cuts, inflation was extremely low. As measured by the consumer price index, it fell from 3.4% in 2000 to 1.6% in 2002, and then rose to 2.3% in 2003. With the federal funds rate declining by 5.5 percentage points from 2000-2003, there was no tightening of monetary policy to offset the inflationary effects of fiscal policy. At most, the easing of monetary policy that occurred would have been larger in the absence of the tax cut—but the Fed was

limited by how much further monetary policy could have been eased under traditional methods since short-term interest rates were brought down to 1%, close to the zero bound.

Consumption

It is often assumed that insufficient aggregate spending, the source of recessions in Keynesian models, refers to personal consumption spending. In fact, aggregate spending is composed of personal consumption, private investment, government spending, and net exports, and a shortfall in any of these components can cause a recession.

In 2001-2003, consumption growth was slightly below normal, but was consistently the strongest component of GDP growth, as seen in **Table 6**. Thus, it would be inaccurate to characterize the 2001 recession as being caused by insufficient consumer spending. By far, the weakest component of the economy was private investment spending, as will be discussed below. This is not unusual: in all of the post-war recessions, investment spending growth was lower than GDP growth, and consumer spending was higher than GDP growth.⁹ At most, consumption spending indirectly caused the recession if businesses responded to sub-par consumption spending by reducing investment spending.

Table 6. Growth Rate of GDP, Consumption, and Investment, 2000-2004

Growth Rate:	2000	2001	2002	2003	2004
GDP	3.7	0.8	1.6	2.7	4.2
Consumption	4.7	2.5	2.7	2.9	3.9
Fixed Investment	6.5	-3.0	-5.2	3.6	9.7

Source: BEA.

Note: All figures are calculated as percent change from previous year.

The tax cuts may have helped sustain personal consumption by increasing after-tax disposable income; however, other factors were also at work. The fastest growing quarter for consumption, the fourth quarter of 2001, seems to have been dominated by one-time automobile sales incentives. Expansionary monetary policy may also have played a role in sustaining consumption since much of the growth in spending was concentrated in interest-sensitive durable goods. Note that the argument that tax cuts boosted consumption spending is mutually exclusive with the supply-side argument, described below, that tax cuts will boost national saving.¹⁰

Effects of a Tax Cut in Long-Term Growth Models

Although Keynesian models are useful for understanding short-term fluctuations in the business cycle, they provide little insight into the causes of long-term growth when the economy is already at full employment. In other words, Keynesian models emphasize movements in aggregate demand, and de-emphasize changes in aggregate supply. Although the short-term might appear to be a more worthy goal of fiscal policy than the long term, many economists would argue that the short-term effects of fiscal policy have been over-emphasized, and the long-term effects neglected. That is because the Federal Reserve and market forces have proven able to keep the

⁹ See CRS Report RL31237, *The 2001 Economic Recession: How Long, How Deep, and How Different From the Past?*, by Marc Labonte and Gail E. Makinen.

¹⁰ The Keynesian prediction of higher consumption is also in contrast to intertemporal models with Ricardian equivalence (described below), which predict that consumption would fall in response to a deficit financed tax cut.

economy growing steadily for sustained periods of time without relying on activist fiscal policy. In which case, when the economy is not in a recession, the advice derived from Keynesian models will be based on factors that are not particularly relevant at that point in time.

Since the 2001 tax cuts were enacted during a recession, Keynesian models are probably the single best guide for evaluating its effects at the time. Yet by the time the 2003 tax cuts were passed, the economy had nearly returned to full employment (at least based on GDP data). Furthermore, going forward into the future, these tax cuts (if made permanent) will continue to have an effect on the supply side of the economy, but no effect on the demand side of the economy. Thus, growth models can play a valuable role in evaluating the long-run effects of these tax cuts. And when evaluating tax cuts in the abstract, it may be most sensible to assume that the economy is at full employment—since recessions are rare—and omit demand-side effects from the analysis.

Neoclassical Solow Growth Model

The standard neoclassical growth model developed by Nobel Laureate Robert Solow explains growth in terms of the input of resources into production that lead to greater output. In the basic model, inputs are labor and physical capital (plant and equipment). Any increase in production that is not attributable to these two inputs (e.g., improved business practices) is caused by productivity growth.¹¹ Over long periods of time, technological change (which is recorded as productivity growth) dominates per capita output growth, which suggests that the permanent economic effects of any tax cut will be limited. Output cannot be influenced by changes in spending, as in Keynesian models, and there is typically no monetary sector in the model. The government can only indirectly influence labor inputs and productivity through policies that promote the two. However, it can directly affect capital inputs.

Saving and Investment

By identity, capital investment is exactly equal to national saving, and saving can be undertaken by individuals, businesses (through retained earnings), or the government. When the government runs a budget surplus, it increases national saving; when it runs a deficit, it decreases national saving because it must borrow to finance expenditures in excess of revenues. Thus, deficit-financed tax cuts of the type the United States has pursued in the past few years reduce economic growth in Solow growth models by reducing national saving, which in turn lowers private investment.¹² As national saving falls, interest rates—the cost of borrowing—rise as firms bid for a shrinking pot of resources to finance their investment spending. This is often referred to as the “crowding out” effect.¹³

The decline in growth caused by the budget deficit predicted by the Solow model is based on two assumptions. First, private saving (at the household or corporate level) does not rise to offset the

¹¹ The analogous measure recorded by the Bureau of Labor Statistics is called total factor productivity growth.

¹² More precisely, growth in Solow models declines in the medium run when the rate of capital formation declines. In the steady state, changes in the rate of capital formation have no effect on growth.

¹³ A similar effect occurs in Keynesian models, for different reasons. In the Keynesian model, the rise in aggregate spending resulting from the budget deficit causes the demand for money to rise. To restore equilibrium in money markets, interest rates must rise. When interest rates rise, investment spending and interest-sensitive spending declines. The primary difference between the Solow model and Keynesian model is that growth cannot fall as the result of a deficit in the Keynesian model, as it does in the Solow model. That is because interest rates only rise if aggregate spending rises. At most, the crowding out of investment can entirely offset the rise in aggregate spending, so that growth does not rise, but it cannot cause growth to fall.

fall in government saving. This possibility will be explored in the section below on supply-side effects. Second, investment is not financed from abroad to offset the fall in government saving, which will be considered in the next section.

Table 7 shows what happened to saving and investment after the tax cuts. The budget deficit shifted by 6 percentage points of GDP between 2000 and 2004. Of this, about 2.3 percentage points of the shift can be attributed to the tax cuts, according to official *ex-ante* estimates. Over the same period, private saving did not rise nearly enough to offset the decline in public saving of 6 percentage points of GDP—private saving rose by 1.4 percentage points, so national saving fell by 4.6 percentage points of GDP. At the same time, the recession and stock market decline caused investment demand to decline by 3.1 percentage points of GDP. This partly explains why interest rates did not rise as a result of the budget deficit—interest rates are determined by supply and demand, and the supply of saving and the demand for investment happened to fall simultaneously for unrelated reasons. The reduced investment demand was a temporary factor, caused by the recession, however. Had investment stayed at its 2000 level, there would have been only three quarters as much national saving available to finance it.

Table 7. Budget Deficits, Trade Deficits, Saving, and Investment
(as a % of GDP)

	Investment Spending	National Saving	Budget Surplus/ Deficit (-)	Private Saving	Trade Deficit (Net Foreign Borrowing)
1995-1999	19.1	17.3	-0.3	15.4	1.8
2000	22.1	18.0	2.4	13.6	4.0
2001	20.0	16.4	1.3	13.8	3.7
2002	18.6	14.2	-1.5	14.9	4.4
2003	18.0	13.4	-3.5	15.1	4.6
2004	19.0	13.4	-3.6	15.0	5.6

Source: Bureau of Economic Analysis.

Note: Investment spending includes private and public investment.

The decline in investment spending is pertinent because certain provisions of JCWAA and JGTRRA were specifically aimed at boosting capital investment. JCWAA contained temporary accelerated depreciation provisions for certain types of capital investment (structures were a notable exception) and this provision was extended and expanded under JGTRRA. JGTRRA also temporarily increased the amount of investment that an unincorporated businesses can expense.¹⁴

The effectiveness of these provisions depends on whether they caused capital investment to be higher than it otherwise would have been. In fact, capital investment fell by 2.0 percentage points of GDP between 2001 and 2003. As with any tax cut, evaluating the efficacy of these provisions is hindered by uncertainty concerning how much lower capital investment would have been without the provisions. The efficacy of the provisions may have been partly offset because they were deficit financed, due to the crowding out effect.

¹⁴ See CRS Report RL32034, *The Jobs and Growth Tax Relief Reconciliation Act of 2003 and Business Investment*, by Gary Guenther.

In addition to influencing the overall level of investment spending, these provisions may have distorted the form of capital investment since not all types of investment were eligible. This may explain why the decline in capital investment was so concentrated in structures, which were not generally eligible under the provisions. Between 2001 and 2003, investment in equipment fell by 3%, whereas investment in structures fell by 21%. This pattern is unusual: investment in structures contracted more than investment in equipment in only two other post-war recessions.

The Trade Deficit

Domestic investment spending can be financed by Americans or foreigners. If the entire decline in public saving caused by the deficit is offset by an inflow of foreign saving, then there will be no increase in interest rates and no crowding out of private investment. The deficit will have other consequences, however. Even if foreign borrowing can be used to finance American investment, the return from that capital will accrue to foreigners, not Americans. U.S. output will exceed national income because some income will accrue to foreign lenders.

Furthermore, to purchase U.S. financial securities, foreigners must first buy U.S. dollars, and this pushes up the value of the dollar. As the dollar appreciates, U.S. exports and import-competing goods become less competitive. This causes exports to fall and imports to rise, increasing the trade deficit. By definition, the increase in the trade deficit will be equal to the borrowing from abroad, because the only way the United States can borrow from abroad is if the U.S. purchases more imports than foreigners purchase U.S. exports.¹⁵

As can be seen in **Table 6**, there is some evidence that the decline in government saving has been partly offset by foreign borrowing. Even though private investment fell by three percentage points of GDP between 2000 and 2004, borrowing from foreigners (the trade deficit) rose by 1.6% of GDP to a record high of 5.6%.¹⁶ Some economists questioned the sustainability of borrowing at that pace, particularly since the demand for borrowing was depressed over most of that period by the fall in capital investment spending.

Supply-Side Effects of a Tax Cut on Labor and Saving

Some argue that tax cuts boost long-run growth by giving individuals a greater incentive to work and save. If tax cuts caused individuals to extend their work hours or join the labor force, this would increase output directly. Likewise, if tax cuts caused individuals to save more—assuming this had no short-run effects on aggregate demand—there would be more saving available for investment, and growth would rise. There are three main problems with this reasoning.

First, capital investment is determined by national saving, not private saving. National saving consists of personal saving, business saving, and public saving. When the government runs a budget deficit, public saving is negative and reduces national saving. Because the recent tax cuts were deficit financed, any increase in private saving they caused would have to exceed the increase in the budget deficit to prevent investment spending from falling. Some of the

¹⁵ These results are identical in a Keynesian “open economy” model with perfect capital mobility. In such a model, the stimulative effects of the tax cut are completely offset by a wider trade deficit. The actual economy is somewhere between the theoretical cases of an open economy and closed economy since capital does flow in and out of countries in response to interest rate differentials, but not sufficiently to eliminate differentials entirely. Thus, the tax cuts will provide some stimulus, but not as much as the “closed economy” Keynesian model would predict.

¹⁶ Looking at the current account, there was a significant decline in trade during the recession. In 2001 the trade deficit increased because exports declined more rapidly than imports. In 2002, the trade deficit increased because imports grew more rapidly than exports.

provisions, such as the dividend tax reduction and repeal of the estate tax, are intended to promote saving, but others are likely to encourage consumption.

Second, it is not clear theoretically whether tax cuts would increase or decrease growth. Marginal reductions in income tax rates, elimination of the estate tax, and dividend tax reductions, have a separate “substitution effect” and “income effect.” By making work and saving more rewarding, these tax cuts may induce individuals to undertake more of each. This is called the substitution effect and raises growth. But there is an opposing income effect that lowers growth. By making individuals more wealthy on an after-tax basis, tax cuts require less work and saving to achieve their financial goals. For example, with a lower tax rate, less saving is needed to reach a target, such as retirement or the purchase of a car or vacation. The net effect on growth will depend on the strength of the substitution effect relative to the income effect. But some of the provisions of the recent tax cuts have no substitution effect; they only have an income effect, and would therefore have a negative effect on growth. These include the child tax credit and marriage penalty relief for most taxpayers.

Third, there is the issue of how large these supply side effects are empirically. Could the substitution effect and income effect cancel each other out so that the effect on growth is negligible? Even if the substitution effect dominates, how much more work will be induced by a reduction in the marginal tax rate from, for example, 31% to 28%? Why has the working week first shortened and then stayed relatively constant over the past century when wages and tax rates were rising?

Empirical research is not conclusive, with some studies finding tax cuts to have a positive effect on labor supply and some finding a negative effect; most of the estimates are modest and some are statistically insignificant (not statistically different from zero). There is little consensus on the effects of tax cuts on personal saving. Reflecting the empirical literature, the Joint Committee on Taxation assumed in its macroeconomic model a labor supply substitution elasticity of 0.18 and an income elasticity of -0.13, so that the two almost cancel out for a very small labor response. This means that a 10% reduction in after-tax income would lead to a 0.5% increase in labor supply (and a smaller increase in GDP). It assumes a long-run saving elasticity of 0.29.¹⁷ CBO assumed a labor supply elasticity of 0.07 for primary earners and a 0.5 elasticity for secondary earners.¹⁸ Research suggests that working-aged males are not very sensitive to changes in tax rates: they tend to work full-time regardless of the tax rate. Their ability to alter their hours in response to a change in tax rates may be limited, at least in the short term. Some married women, older workers, and younger workers may be more sensitive to tax rates because they are less attached to the workforce, but estimates of their sensitivity vary significantly from study to study. The dramatic rise in female labor force participation in the post-war period suggests that cultural factors may be a far more important determinant of labor supply than tax policy—and, in the case of married women, may have already run their course.¹⁹

Casual observation does not reveal higher labor supply or national saving since the recent tax cuts have been enacted. As seen in **Table 7**, private saving has risen since 2000, but by less than one third as much as public saving has fallen. While less than half of the decline in public saving is attributed to the tax cuts, the increase in the deficit caused by the tax cuts alone exceeded the increase in private saving. Furthermore, some of the increase in private saving could have been

¹⁷ John Diamond and Pamela Moomau, “Issues in Analyzing the Macroeconomic Effects of Tax Policy,” *National Tax Journal*, vol. LVI, no. 3, September 2003, p. 447.

¹⁸ Congressional Budget Office, *How CBO Analyzed the Macroeconomic Effects of the President’s Budget*, July 2003.

¹⁹ For an analysis and literature review of these issues, see CRS Report RL31949, *Issues in Dynamic Revenue Estimating*, by Jane G. Gravelle.

motivated by unrelated factors, such as precautionary saving in response to the recession. Finally, the composition of the increase in saving casts further doubts on causation. With the exception of accelerated depreciation, all of the major provisions of the tax cuts affected individuals. Yet the increase in private saving is entirely attributable to increased business saving—personal saving actually fell from 1.7% to 1.3% of GDP between 2000 and 2004, as seen in **Table 8**.

Since 2000, labor supply has fallen, both in terms of total employment and hours worked, as seen in **Table 8**. Of course, this decline was overwhelmingly attributable to the recession and sluggish recovery through 2003. But it suggested that any supply side incentives to work more were swamped by the weakness of the economy and were not a significant factor even after growth picked up in 2004. This might be expected since the provisions with effects at the margin were small. For example, the reductions in marginal individual tax, estate tax, and dividend tax rates caused a combined revenue loss of less than 1% of GDP annually from 2001 to 2004.

Table 8. Labor Supply and Saving Indicators, 2000-2004

	Average Weekly Hours (% change from prior year)	Employment/Population Ratio	Personal Saving Rate (% of GDP)
1995-1999 (average)	0.1%	63.7%	2.8%
2000	-0.8	64.4	1.7
2001	-1.3	63.7	1.3
2002	-0.4	62.7	1.7
2003	-0.4	62.3	1.5
2004	0	62.3	1.3

Source: Bureau of Labor Statistics.

It should also be noted that any change in labor supply in response to a tax cut will be a one-time effect only, as the labor supply moves from the old hours worked to the new hours worked. After that, labor supply will not continue to grow in response to the tax cut.²⁰ By contrast, the effects of the deficit on saving are ongoing (until the economy returns to its steady state). If the deficit-financed tax cuts result in a decline in national saving, as the data would seem to indicate, then the negative effect on growth would be ongoing.

Although the difference between demand-side effects and supply-side effects are distinct in theory, it is difficult to disentangle them in practice. Assume taxes are cut in a recession caused by insufficient consumption, leading to higher aggregate spending as the tax cuts are spent by individuals. The increase in aggregate spending would bring *involuntarily* unemployed workers back into the labor force and increase the hours of *involuntarily* underemployed workers. In a supply-side analysis, unless properly controlled for, it would appear that workers were responding to the incentives of lower tax rates to *voluntarily* increase their labor supply, and would be taken as evidence in favor of supply-side economics. This also suggests that many workers will not be able to take advantage of supply-side incentives that do exist in recessions because they will not be able to voluntarily increase their hours at a time when labor is underutilized.

²⁰ The only ongoing effect from an increase in the labor supply on economic growth comes from the fact that some of the additional output generated from the one-time increase in labor supply will be invested, leading to growth in the capital stock.

Intertemporal Models

Beginning in the 1970s, many economists grew discontented with Keynesian and Solow models because of their ad-hoc, non-theoretical nature.²¹ They turned to macroeconomic models based on rational optimization by individuals over time, referred to here as intertemporal models. Infinite horizon models and overlapping generation models (such as life-cycle models) are some prominent examples in this category. In these models, individuals plan their lifetime work, leisure, saving, and consumption choices at present in order to maximize their lifetime utility (well-being). The advantage of these highly sophisticated, highly mathematical models is that every decision made by individuals is rooted in a logical, coherent decision. The disadvantages are that these models make unrealistically complex assumptions about how individuals make decisions and the models are more grounded in theory than evidence—particularly because their theoretical complexity makes empirical estimation problematic.²² For example, infinite horizon models assume that individuals live (and have planned their work, saving, and consumption) forever. Even if one believes that concern for one's descendants makes the infinite horizon close to actual behavior for parents, not everyone has descendants or values their descendants' well-being on par with their own. As another example, the models often do not feature uncertainty (or uncertainty is assumed to cancel out in the aggregate) about future earnings, prices, rates of return, or government policies when individuals make decisions today.

Because of the long time-frame taken by these models, a deficit-financed tax cut cannot be evaluated because it is not a sustainable policy—eventually, a tax cut must be offset by higher taxes or lower government spending or else the national debt would become infinitely large.²³ Thus, when these models are used to evaluate tax cuts, some assumption must be made about higher taxes or lower spending at some point in the future. Although there is no obvious choice for when the policy change is likely to occur or what form it is likely to take, these choices are unfortunately critical to the model's results. The primary reason why saving and labor supply change in these models when taxes are cut is because of the wedge they create between after-tax wages and interest rates now relative to the future. For example, in a life-cycle model individuals are assumed to keep their lifetime consumption constant. When taxes are cut today and raised in the future, the model predicts that individuals will work and save more today, when taxes are low, in order to work and save less when taxes are raised. If the tax cut leads to a seemingly innocuous change in interest rates, this can affect labor supply today because a higher interest rate makes the discounted value of leisure in the future greater. As a result, people work more today so they can save more and work less in the future. If the tax cuts are instead assumed to be financed through lower future government spending, in many of these models, there is a smaller labor and saving response induced by the tax cut since private spending cannot be substituted for government spending.

²¹ See, for example, Robert Lucas and Thomas Sargent, *After Keynesian Macroeconomics*, in Federal Reserve Bank of Boston, Conference Series 19, June 1978, p. 49. For a defense of Keynesian economics against this critique, see Benjamin Friedman, *Comment*, in Federal Reserve Bank of Boston, Conference Series 19, June 1978, p. 73. Neo-Keynesian models have been developed that make similar assumptions about intertemporal optimization, but feature sticky prices in the short run.

²² Intertemporal models have not been without their critics. A group of economists known as behavioral economists have developed new economic models based on irrational, rule of thumb, and “bounded rational” behavior. For an overview of behavior economics, see Richard Thaler and Sendil Mulianathan, *Behavioral Economics*, National Bureau of Economic Research, Working Paper 7948, October 2000. For the application of behavioral economics to tax policy, see B. Douglas Bernheim, “Taxation and Saving,” in Alan Auerbach and Martin Feldstein, eds., *Handbook of Public Economics* (Amsterdam: Elsevier Science, 2002), p. 1200.

²³ Because of interest costs, the future higher taxes or lower government spending will exceed the size of the original tax cut.

These models also contain, to varying degrees, effects known as “Ricardian equivalence.” Ricardian equivalence is the theoretical notion that budget deficits would not cause interest rates to rise because individuals know the deficits will be offset by higher taxes or lower government spending in the future. As a result, private saving rises today to prepare for future consumption losses, and replaces the fall in public saving, so that there is no net effect on national saving and capital investment. In infinite horizon models, there is total Ricardian equivalence because people are assumed to live forever. In overlapping generations models, such as life cycle models, the Ricardian effect is only applicable to those generations that will still be alive when taxes are raised or spending is cut, so there is only a partial private saving offset.

The theoretical sophistication of intertemporal models comes at the expense of empirical accuracy. Because the models are so complex, they cannot be empirically estimated directly. Instead, the models are simulated with certain key parameters inferred from empirical evidence; some of the parameters must be inferred because they are also too complex to measure directly. For this reason, the model results should not be considered direct evidence of a tax cut’s effect.

Most economists believe these models do a poor job of explaining economic activity in the short run.²⁴ In these models, there are no demand-side effects, such as involuntary unemployment (i.e., everyone who wants a job can find one) or excess capacity. There tends to be no modeling of monetary policy since there are no short term effects. Workers are free to lower or raise their work hours, or even enter or exit employment, as they desire. Indeed, when these models generate substantial growth effects in response to a tax cut, it is because they assume that work and saving patterns (voluntarily) fluctuate greatly because the tax cut changes present and future economic conditions. Although these models may offer certain insights into behavior over the long run, they are unsuitable for evaluating a tax cut whose purpose is short-term stimulus in a recession.

Overview of Simulations

Before EGTRRA and JGTRRA were enacted, a number of simulations were performed that estimated their economic effects using the economic models discussed above. (No estimates of JCWAA’s effects were found.) As tax cut proposals move through the policy process, details change. The estimates presented here are based on proposals that may differ slightly from the policy that was eventually enacted. It should be stressed that all of the estimates were made before the fact; none of the estimators examined the data retrospectively to check their accuracy.

Nearly all of the simulations showed that the tax cuts would have positive effects in the short run and negative effects in the long run. Often, the long-run effects did not entirely materialize by the end of the traditional 10-year forecast window. Thus, the tax cuts cannot be said to be unambiguously good or bad; the merits of this tradeoff depend on a policymaker’s preferences over time.

Simulations of EGTRRA’s Effects

Macroeconomic Advisers

The private forecasting firm Macroeconomic Advisers (MA) used a model with Keynesian properties for the first few years after a tax cut. Thus, the tax cut mainly affected the economy by boosting aggregate demand—including large multiplier effects—not supply-side effects. In the

²⁴ Real business cycle models are dynamic optimization models used to analyze short-run cyclical fluctuations. They are not analyzed here because they are not typically used to assess the effects of tax cuts.

long run, the model had neoclassical properties. MA estimated that EGTRRA would boost growth by 1.2 percentage points in the second half of 2001 (in other words, 0.6 percentage points for the entire year) and 0.3 percentage points in 2002. In 2002, MA projected that the Fed would keep interest rates 0.75 percentage points higher as a result of the tax cut. MA did not offer information on the tax cut's long-term effects.²⁵

DRI-WEFA

The private forecasting firm DRI-WEFA (now Global Insight) also used a model with Keynesian properties and multiplier effects for the first few years after a tax cut, and neoclassical properties over the long run. Although they did not do a full analysis of EGTRRA's effects, they did predict that EGTRRA would increase growth in the second half of 2001 by 0.4 percentage points through a boost to aggregate spending.²⁶

Auerbach

Alan Auerbach of University of California-Berkley used the Auerbach-Kotlikoff model, an intertemporal life-cycle model, to evaluate the economic effects of EGTRRA over the next 150 years. This model did not contain short-term business cycle properties. Like all intertemporal models, a permanent deficit-financed tax cut is inconsistent with the model because it would have caused the national debt to grow indefinitely. Auerbach assumed that the tax cut would result in higher taxes at some point in the future and ran simulations in which either the tax on labor or the tax on capital was raised; an increase in the wage tax reduced output more than an increase in the capital tax. Faced with lower tax rates in the short run and higher tax rates in the long run, the model assumed that individuals work and save more while the tax cut is in place, and work and save less while the permanently higher tax rates are in place. As a result, saving rates and output were increased while the lower tax rates were in place, and lowered while the permanently higher tax rates were in place. The eventual increase in taxes reduced GDP; the longer the tax increase was postponed, the more long run GDP fell. The tax cuts caused output to rise by about 1% by 2004. In the first year of the tax increase, output declined by enough to leave it below the baseline level, and in the long run output was 1%-2.5% lower.²⁷

Gale and Potter

William Gale and Samara Potter of Brookings Institution used a neoclassical Solow model with supply-side effects to estimate the effects of EGTRRA.²⁸ This model did not capture short-run business cycle dynamics; instead, it estimated the tax cut's long-run effect on the economy. It was estimated that the tax cut would reduce GNP by 0.68% in 2011, because the crowding out effect of budget deficits is estimated to reduce GNP by 1.63%. This was partly offset, they believe, by incentive effects on labor and private saving (0.95 percentage points).²⁹

²⁵ Macroeconomic Advisers, *Economic Outlook*, vol. 19, no. 5. June 2001, p. 5.

²⁶ DRI-WEFA, *Economic Outlook*, May 2001, p. 2.

²⁷ Alan Auerbach, "The Bush Tax Cut and National Saving," *National Tax Journal*, vol. LV, no. 3, September 2002, p. 387.

²⁸ William Gale and Samantha Potter, "An Economic Evaluation of the Economic Growth and Tax Relief Reconciliation Act of 2001," *National Tax Journal*, vol. LV, no. 1, March 2002, p. 133.

²⁹ When considering the welfare effects of a tax cut in a model with capital flows, it may be more useful to look at GNP, which measures the output of Americans, than GDP, which measures the output in the United States. That is because the GDP growth stemming from capital inflows accumulates to foreigners rather than Americans. Gale and

Economic Effects of the 2001 Rebate

One provision of EGTRRA provided what was referred to as a “rebate” of up to \$600 as an advanced tax credit in lieu of the 10% tax bracket.³⁰ Some studies have looked specifically at the effects of this credit on consumption and saving. Unlike the other studies summarized here, these studies were estimated from ex post empirical evidence, and were not based on ex ante simulations using macroeconomic models.

David Johnson, Jonathon Parker, Nicholas Souleles used regression analysis to determine whether the rebate affected the consumption of nondurable goods.³¹ They found that 23%-37% of the rebate check was spent on higher nondurable consumption within the first three months of receipt. If the remainder of the rebate was saved, then the effect on aggregate demand is likely to be modest; however, it may have been spent on services, durable goods, or investment goods, which the study did not include. Evidence showed that most of the remaining rebate was spent within the next two quarters, although those findings were not statistically significant.

Econometric studies of this type are hampered by several factors, including self-reporting errors (a problem with most economic data), random fluctuations in high frequency data, insufficient variation in the data over time because most of the rebate checks were received within two months, and omitted variable bias, both because the study did not control for other factors influencing consumption over time (e.g., macroeconomic conditions) and because the control group of rebate non-recipients may have differed in important ways (e.g., income and marital status) that influenced consumption, thereby attributing the influence of those omitted variables to the rebates. When non-recipients were excluded from their calculations, the results became statistically insignificant.

Joel Slemrod and Matthew Shapiro of the University of Michigan analyzed the results of telephone surveys before and after the rebate was sent. The survey asked individuals whether they planned to/had mostly spent the rebate, saved the rebate, or use the rebate to pay down debt. (From an economic perspective, the last two choices are both a form of saving, and only the first response would lead to an increase in aggregate spending.) In both surveys, about one-quarter planned to mostly spend the rebate and about three-quarters planned to save it or used it to pay down debt, which does not suggest the rebate had strong stimulative effects. Survey results should be considered with caution because it is well-known among researchers that survey responses often differ systematically from actual behavior. The authors argued that the sharp increase in the personal saving rate in the months that the rebate were sent out supports their findings.³²

Potter estimate that GDP would be 0.37 percentage points higher than GNP.

³⁰ See CRS Report RS21171, *The Rate Reduction Tax Credit - "The Tax Rebate" - in the Economic Growth and Tax Relief Reconciliation Act of 2001: A Brief Explanation*, by Steven Maguire.

³¹ David Johnson, Jonathon Parker, Nicholas Souleles, *The Response of Consumer Spending to the Randomized Income Tax Rebates of 2001*, Working Paper, February 2004.

³² Joel Slemrod and Matthew Shapiro, *Did the 2001 Rebate Stimulate Spending?* National Bureau of Economic Research, Working Paper 9308, October 2002.

Simulations of JGTRRA's Effects

JCT

The Joint Committee on Taxation estimated the economic effects of JGTRRA as it was passed using three different models.³³ Thus, the committee assumed that JGTRRA would be allowed to expire in 2013, as scheduled, and the tax cuts (with the exception of new dividend and capital gains tax cuts) are an acceleration of tax cuts that, in the baseline, would have already gone into effect in future years.

The JCT used two models with Keynesian short-term properties and neoclassical long-term properties, a proprietary model and the Global Insight model. Assuming that the Federal Reserve (Fed) responds aggressively to keep inflation stable—consistent with their actual behavior in recent years—the proprietary model predicted that GDP would be increased by a cumulative total of 0.2% after five years. With a less aggressive Fed, the Global Insight model predicted that GDP would be increased by a cumulative total of 0.9% after five years. In both models, GDP would be reduced by a cumulative total of 0.1% over the next five years, primarily due to crowding out. The third model was an intertemporal life cycle model, which, as discussed previously, required an assumption that taxes will be raised or spending cut in the future to finance the tax cut. The life cycle model predicted that GDP would be increased by a cumulative total of 0.2% over the first five years, and decreased by a cumulative total over the next five years by 0.1% if the tax cuts were financed by reduced government transfer payments (e.g., Social Security) after 2013 and reduced 0.2% if financed by higher taxes after 2013. In other words, the negative effects on growth would begin even before taxes are raised or spending is cut.

Because the dividend tax cuts and accelerated depreciation create an incentive to invest in capital equipment, the models predicted that investment in residential housing would decline as investors shift from investment in housing to equipment.

CBO

The Congressional Budget Office evaluated the economic effects of the President's overall budget proposal for FY2004.³⁴ This differed from JGTRRA because it included other spending and revenue proposals, and the analysis was based on the tax cut that was proposed by the President, not what he signed into law. Still, the tax cut was the most significant budgetary proposal in FY2004, and the President's proposal was arguably close to the version enacted, so CBO's analysis was pertinent. (One important difference between the President's proposal and JGTRRA was that the President proposed to make EGTRRA/JGTRRA permanent.) Because of the uncertainty and complexity surrounding macroeconomic modeling, CBO employed five different econometric models and nine different scenarios to make its projections. Although the results varied by model and scenario, all were modest relative to GDP. All of the models predicted that the tax cuts would increase interest rates, except under the open economy assumption where borrowing from abroad completely compensates for the fall in national saving.³⁵

Using a Solow growth model, the President's budget proposals were projected to decrease GDP by an average of 0.2% from 2004 to 2008 and an average of 0.7% from 2009 to 2013. The tax

³³ Joint Committee on Taxation, "Macroeconomic Analysis of H.R. 2," *Congressional Record*, Doc 2003-11771, May 8, 2003.

³⁴ Congressional Budget Office, *An Analysis of the President's Budgetary Proposals for FY2004*, March 2004.

³⁵ Congressional Budget Office, *How CBO Analyzed the Macroeconomic Effects of the President's Budget*, July 2003. The increase in interest rates were largest in the Keynesian simulations and lowest in the intertemporal simulations.

cuts reduced growth because the increase in labor supply was not sufficient to offset the decrease in the capital stock caused by the larger budget deficit. In this model, CBO assumed that labor supply would increase and 65% of the decline in public saving caused by government borrowing would be offset by higher private saving and borrowing from abroad; without these ad hoc offsets (which are not empirically estimated), the decline in GDP would be greater.

CBO's evaluation produced six different results based on intertemporal models. Because intertemporal models require that the budget eventually return to balance, CBO applied different scenarios, in which lump-sum taxes were raised or spending was cut after 10 years.³⁶ It produced results with an infinite horizon model and a life cycle model, both under an open economy (i.e., the United States can borrow from abroad) and closed economy assumption. It estimated that the budget proposals would reduce GNP if financed by lower government spending after 2013 (GNP would change 0.2% to -0.8% from 2004 to 2008 and -0.6 to -2.0 from 2009 to 2013) but increase GNP if financed by higher taxes after 2013 (GNP would increase by 0.3% to 0.9% from 2004 to 2008 and 0.3% to 1.4% from 2009 to 2013).³⁷ It may sound counter-intuitive that higher future taxes are better for the economy than lower government spending, but that is because of the oddities of the intertemporal models.³⁸ Because individuals are assumed not to value government spending—a highly unrealistic assumption—there is less incentive to work and save more in the first 10 years in response to the tax cuts when they are financed through lower government spending. By contrast, when the tax cuts are financed through higher future taxes, these models assume that there is a large incentive to work and save more now, in order to work and save less once taxes are raised.

CBO also estimated the economic effects of the budget proposals using two Keynesian models, the MA model and the Global Insight (GI) model. For these models, CBO estimated results only for five years because the models are designed to capture only short-run phenomena. CBO added larger labor supply responses to the models than the original modelers estimated. On average, the proposals would increase GDP by 0.2% in the MA model and 1.4% in the GI model. In both models, the supply-side effects were negative and the demand-side effects were positive over five years: GDP increased only because of the stimulus to aggregate spending. The increase in GDP would be possible only if the Fed did not offset it, which it might do to keep inflation from rising. In the MA model, GDP would be higher for the first three and lower for the next three years. In the GI model, GDP would be higher for every year of the projection.

Macroeconomic Advisers

As mentioned above, the Macroeconomic Advisers (MA) model used Keynesian properties for the first couple of years of a simulation, and neoclassical properties in the long run. MA, a private forecasting firm, projected that JGTRRA would boost growth by 0.5 percentage points in 2003 and 1.0 percentage points in 2004. They projected that JGTRRA would reduce growth in later years, leaving GDP 0.3% lower by 2017. (The long-run effects are largely the result of the Administration's proposal to make EGTRRA permanent; a provision that was not included in the version of JGTRRA signed into law.) Because the economy was already close to full

³⁶ CBO's assumption that the President's Budget proposals would be financed through higher future lump sum taxes (e.g., a head tax) is curious since the government does not currently collect any lump sum taxes. CBO reports that if it had instead assumed that the Budget proposals were financed with marginal tax increases, the increase in GDP would have been smaller.

³⁷ The results for GDP are equal to the GNP results for closed economy models. In the open economy variation, GDP is slightly higher because it includes the income accruing to foreigners as a result of net capital inflows.

³⁸ Higher taxes reduce GDP in the model outside the reported 10 year projection window.

employment, JGTRRA would cause inflation and interest rates to rise quickly in their model. As a result, while JGTRRA would reduce unemployment from 2003 to 2006, it would increase unemployment from 2006 through the rest of the decade. JGTRRA was projected to raise long-term interest rates by an average of 0.34 percentage points over five years and 0.75 percentage points in the long run due to crowding out.³⁹

One important assumption MA made was that the acceleration of tax cuts already scheduled to take place as a result of EGTRRA were modeled as new tax cuts, rather than accelerated tax cuts; if individuals did not treat them as new, their effect on aggregate demand would be smaller.⁴⁰

Global Insight

As mentioned above, the Global Insight (formerly DRI-WEFA) model used Keynesian properties for the first couple of years of a simulation, and neoclassical properties in the long run.⁴¹ Global Insight's model projected that JGTRRA, as proposed by the Bush Administration, would increase growth by 0.2 percentage points in 2003, 0.9 percentage points in 2004, and 0.1 percentage points in 2005, primarily by stimulating aggregate demand. After that point, JGTRRA would reduce economic growth by 0.5 percentage points in 2006, and smaller amounts for a couple of years after that, primarily through the crowding out effect of the budget deficit. JGTRRA was also projected to increase inflation by 0.2-0.3 percentage points per year through 2006, with the inflation rate remaining 0.1 percentage points higher for the remainder of the 10-year projection. Interest rates were about 0.25 percentage points higher for most of the 10-year projection, resulting in a stronger dollar and larger current account deficit. The dividend tax cut was projected to initially boost stock prices by 5%, but prices fell slightly by the end of the projection.⁴²

Conclusion

This report studied the macroeconomic effects of the tax cuts enacted between 2001 and 2003. There is no direct way to determine the effects of a tax cut on the economy because there is no way to observe the counterfactual case where the tax cut did not occur. Estimates were made by comparing the results of macroeconomic models with and without the tax cuts. These estimates were made before the tax cut occurred, and were not based on actual *ex-post* data. Unfortunately, there is no consensus among macroeconomists as to which one model is most suitable for policy simulations, and no model with a strong track record in accurately projecting economic events. The different models vary in fundamental ways, and no one model incorporates every key aspect of economic behavior. Keynesian models focus on the business cycle but neglect the determinants of long-run growth. Neoclassical growth models and intertemporal models concentrate on long-run growth, but do not feature recessions, involuntary unemployment, or monetary policy. The

³⁹ Macroeconomic Advisers, "A Preliminary Analysis of the President's Jobs and Growth Proposals," mimeo, January 2003.

⁴⁰ Estimates of a tax cut's effects are sensitive not only to the model used, but the assumptions entered into the model. The Heritage Foundation also used the Global Insight model to estimate the effects of JGTRRA and found more favorable results by using more favorable assumptions. However, even using more favorable assumptions, they estimated that the tax cut would have a negligible effect on GDP growth after the first two years. Over ten years, they estimates that on average the tax cut would have no effect on economic growth. William Beach et al., *The Economic and Fiscal Effects of the President's Growth Package*, Heritage Center for Data Analysis, April 2003.

⁴¹ The model has been criticized for having extremely long lasting Keynesian effects. For example, even at the end of the 10-year projection, JGTRRA still causes aggregate demand to exceed the baseline in their model.

⁴² Cynthia Latta, "The 2003 Stimulus and Growth Plans Compared," Global Insight, *U.S. Economic Outlook*, February 2003.

results generated by intertemporal models are based on assumptions about behavior that most people would find highly unrealistic. Despite the wide diversity of the models used, all of the results are relatively small, as would be expected of tax cuts that are relatively small in relation to GDP in the years considered.

Economic Growth in a Keynesian Model

Keynesian models predict that deficit-financed tax cuts would boost output during a recession by increasing spending so that slack labor and capital resources are brought back into production. For the individual income tax cuts, higher consumption in response to higher after-tax income is the channel through which spending is boosted. This boost in growth is temporary because the growth rate of spending cannot exceed potential production over time. Keynesian macroeconomic models are the only popular model that allows for short-run business cycle fluctuations. The effect of growth in other macroeconomic models is considered next.

The economy was in a recession of mild depth and average contraction when EGTRRA was passed. The recovery was unusually sluggish for the first six quarters, during which JCWAA and JGTRRA were passed, before a more normal growth rate took root. Proponents point to the short and mild recession as evidence that EGTRRA boosted growth. Opponents point to the sluggish recovery as a sign that the tax cuts were ineffective, and credit monetary expansion and normal market forces for the mild recession. Opponents also point to the performance of labor markets as evidence that the tax cuts did not appreciably stimulate spending.

Investment, National Saving, Interest Rates, and Growth in the Solow Model

Deficit-financed tax cuts reduce public saving; unless this is offset by higher private saving or borrowing from abroad, national saving will be reduced and interest rates will rise. Most empirical estimates suggest that the offset will be only partial (because some of the tax cut is not saved), and national saving will fall. The neoclassical Solow growth model predicts that a reduction in national saving would reduce economic growth over the medium term by reducing capital investment. Empirical evidence suggests that marginal tax cuts create incentives to work and save more (referred to as “supply side effects”), but the increases in work and saving are too small to offset the reduction in capital accumulation caused by the budget deficit. Thus, on net, the neoclassical model predicts that growth will be reduced by deficit-financed tax cuts. National saving fell from 2000-2003, but this did not lead to higher interest rates because investment demand fell even more sharply.

Accelerated depreciation, which was the major tax provision in JCWAA and was extended and expanded in JGTRRA, was intended to stimulate capital investment spending. Investment spending sharply contracted during and following the recession. This is not unusual, but it is difficult to make the case that investment spending would have been even lower in the absence of the tax cuts. JCWAA may have distorted investment decisions toward equipment, which qualified for accelerated depreciation, and away from structures, which generally did not qualify. Equipment spending contracted by 3% from 2001 to 2003, whereas spending on structures contracted by 21%. Investment spending recovered in 2004.

Trade Deficit

Deficit-financed tax cuts can be financed through national saving or by borrowing from abroad. Net borrowing from abroad must take the form of a trade deficit. Borrowing abroad will mitigate

the rise in interest rates and the “crowding out” of capital investment, but will lead to dollar appreciation that causes exports and import-competing goods to be “crowded out.” Evidence shows that this has occurred, as the trade deficit increased from 4% in 2000 to 5.6% in 2004. Typically, the trade deficit declines when growth has been low.

Employment and Unemployment in a Keynesian Model

For a mild recession, the contraction in employment and rise in unemployment was unusually long lasting—the longest period of employment decline since the Great Depression. Employment declined throughout and for 21 months after the recession—a post-war record by 10 months. Since the employment contraction was so prolonged, it is difficult to argue it would have been even longer in the absence of the tax cuts.

In Keynesian models, tax cuts boost employment and reduce unemployment by boosting aggregate spending. The other macroeconomic models do not feature involuntary unemployment, and make no prediction that tax cuts will affect unemployment.

Supply-Side Effects on Labor Supply and Private Saving

“Supply-siders” focus on the incentives that tax cuts provide to work and save more. However, marginal tax cuts could theoretically lead to more or less work because tax cuts also reduce the labor and saving required to meet income targets. (Tax cuts without marginal effects, such as the child tax credit, unambiguously reduce work and saving.) It is an empirical question as to the size and direction of these effects. Most estimates for labor supply are positive and very small for primary earners, and somewhat larger for secondary earners.

No evidence of supply-side effects from the tax cuts exists thus far. Hours worked and labor force participation both declined after the tax cuts were passed. This was likely due to cyclical factors, which suggest that supply-side effects are not large enough to outweigh other factors. Even in 2004, when the expansion picked up steam, there was still no aggregate increase in labor supply. Private sector saving increased after the tax cuts, but this was due to an increase in business saving. Supply-side analysis predicted that reductions in individual income taxes (particularly reductions in taxes on dividends and capital gains) would lead to higher personal saving by individuals, but personal saving fell between 2000 and 2004.

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